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Certified by



Jon W Dudas

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09/16/03

PROVISIONAL APPLICATION COVER SHEET

22388 U.S. PTO
60/503176
09/16/03

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 C.F.R. 1.53(c).

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| LAST NAME | FIRST NAME | INITIAL | RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY) | |
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| TITLE OF THE INVENTION (maximum 280 characters) | | | | |
| PAINTBALL MARKER WITH MAGNETIC CONTROL | | | | |
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| <input checked="" type="checkbox"/> A check or money order is enclosed to cover the Provisional Application filing fees | | | Provisional Filing Fee Amount: | |
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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Respectfully submitted,

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PAINTBALL MARKER WITH MAGNETIC CONTROL

This invention relates to a paintball gun, or marker, with electromagnetic control of the firing sequence.

Three representative embodiments are depicted. The drawings are in schematic block diagram form, as the shape of the various elements is not significant to the operation. All three have elements in common, as described in relation to Figure 1. The elements having the same number identifiers in Figures 2 and 3 are the same as in Figure 1.

Referring to Figure 1, a paintball marker 10 according to a first embodiment of the invention has a body 12, a breech 14 with a forward end and a rear end, a barrel 16 forward of the breech, a feed tube 18 for loading paintballs 19 into the breech, a reciprocating bolt 20, a source of compressed gas canister 22, a firing mechanism in the form of an electronically actuated valve 24, and a trigger 26. These are common elements found on most autoloading paintball markers. In addition, all three embodiments have a ball sensor 30 positioned to detect the presence or absence of a ball in firing position in the breech. The ball has a signal output to a microprocessor 32. A unique feature in all three embodiments is that they use selectively actuated electromagnets controlled by the microprocessor to effect the movement of the bolt and the release of the propellant gas.

In a first embodiment, as shown in Figure 1, a magnetized portion 28 of the bolt is formed from a magnetized material that will be attracted to or repelled from a magnet. Any ferrous metal or other material that can be magnetized is acceptable. The magnetized portion 28 may also have a core formed from lightweight plastic and have an outer coating of a ferrous metallic material. Alternately, only the front and rear walls of the magnetized portion 28 need have an outer coating of a ferrous metallic material.

The paintball feed tube 18 opens into the breech 14 at a point of entry adjacent the bolt 20 such that paintballs 19 can fall, or be forced, from the feed tube 18 into the breech 14, when the bolt 20 is in its rear or loading position. A sensor 30 is mounted in the breech 14 and is positioned at a selected location to detect the presence or absence of a paintball 19 in the breech 14. The output from the sensor 30 is passed to a control unit 32, typically a microprocessor.

A first 40 and second 42 electromagnet are positioned respectively at a forward end and rear end of the breech 14. The electromagnets 40, 42 are in signal communication with the control unit 32, which is adapted to send an electrical current to energize the electromagnets. The control unit 32 is also in signal communication with the sensor 24 to detect the presence or absence of a paintball at a predetermined position within the breech 14.

When the trigger 26 is pulled, the control unit 32 is activated to initiate a firing cycle operation. The control unit 32 communicates with the sensor 24 in order to detect whether a paintball is in position in the breech 14. If a paintball is in position in the breech 14, the control unit 32 sends an electric pulse to energize the first electromagnet 40. The magnetic field created by the energized first electromagnet 40 will attract the bolt 20, via magnetic force, toward the forward end of the breech 14, and accelerate the bolt toward its forward position. Once the bolt is at or near the forward position, the control unit 32 will cease energizing the first electromagnet, and will send a signal to open the valve 24, thus allowing compressed gas to pass through an aperture in the bolt to propel the paintball down the barrel. The valve will be permitted to open for a preselected time determined by the gas charge selected for the weight and desired ballistics of the ball, and will then be closed, cutting off the flow of compressed gas.

After the paintball is fired, the control unit 32 will energize the second electromagnet 42 to produce a magnetic field that will attract the magnetized portion 26 of the bolt, thereby pulling

the bolt to its rear position, and allowing another paintball to load into the breech. Is long as the control unit detects a signal that the trigger is depressed, it will continue this automatic fire cycle.

In a second embodiment, shown in Figure 2, the bolt 20 has two magnets or magnetized portions - a first bolt magnet 48 at a forward end and a second bolt magnet 50 at the rear end of the bolt. The breech has a first electromagnet 44 at a forward position, and a second electromagnet 46 at a rear position. The first bolt magnet 48 is positioned opposite the first breech electromagnet 44, and the second bolt magnet 50 is positioned opposite the second breech electromagnet 46. The oppositely facing bolt magnets and breech magnets are of similar polarity, such that energizing the electromagnets will repel the bolt away from the corresponding electromagnet.

According to this embodiment, when the trigger 26 which is in communication with the control unit 32 is pulled, the control unit 32 is activated to initiate a firing cycle operation. The control unit 32 communicates with the sensor 24 in order to detect whether a paintball is in position in the breech 14. If a paintball is in position in the breech 14 at a loading position, the control unit 32 sends an electric pulse to energize the second breech electromagnet 46. Energizing the second breech electromagnet 46 will repel the second bolt magnet 50, via magnetic force, toward the forward end of the breech 14. Once at the forward position, the control unit 32 will cease energizing the second breech electromagnet 46, and the control unit 32 will send a signal to the valve to open, and allow compressed gas to pass through an aperture in the bolt for firing the paintball. The valve will be permitted to open for a preselected time, and will then close, stopping the flow of compressed gas. Once the paintball is fired, the control unit 32 will energize the first breech electromagnet 44, thereby repelling the bolt to the rear position, and allowing another paintball to load into the breech.

In a third embodiment, shown in Figure 3, the paintball marker body 12 has a bolt carrier cylinder 52 essentially parallel to the breech, and a bolt carrier piston 54 contained in the cylinder. The bolt 20 and bolt carrier piston 54 are linked via mechanical linkage 60 passing through a slot in the cylinder. The bolt carrier piston 54 is adapted to slide between a rear position and a forward position. The bolt carrier piston 54 is made of or coated with a magnetized material. The bolt carrier cylinder has a first electromagnet 56 at its forward end, and a second electromagnet 58 at its rear end. As described above, the control unit 32 will selectively energize the electromagnets in a sequence that will first move the piston 54 forward. Because the bolt 20 and piston 54 are connected, the bolt 20 will be carried forward when the piston 54 moves forward. Selective activation of the magnets to reverse the magnetic field will move the bolt rearward. This embodiment operates essentially the same as the operation of the embodiment of Figure 1 discussed above.

In an alternate to the Figure 3 embodiment, the piston 54 has magnets on either side, with magnets facing the first and second electromagnets, operating as discussed above, with the magnets having a similar polarity to the polarity of a facing electromagnet. In that embodiment, when the electromagnets are energized, the piston 54 will be repelled from a rear to a forward position, pulling the bolt via the mechanical linkage. This embodiment operates essentially the same as the operation of the embodiment of Figure 2 discussed above.

It is understood that the present invention is not limited to the particular embodiments shown and described herein, but that various changes and modifications may be made without departing from the scope and spirit of the invention.

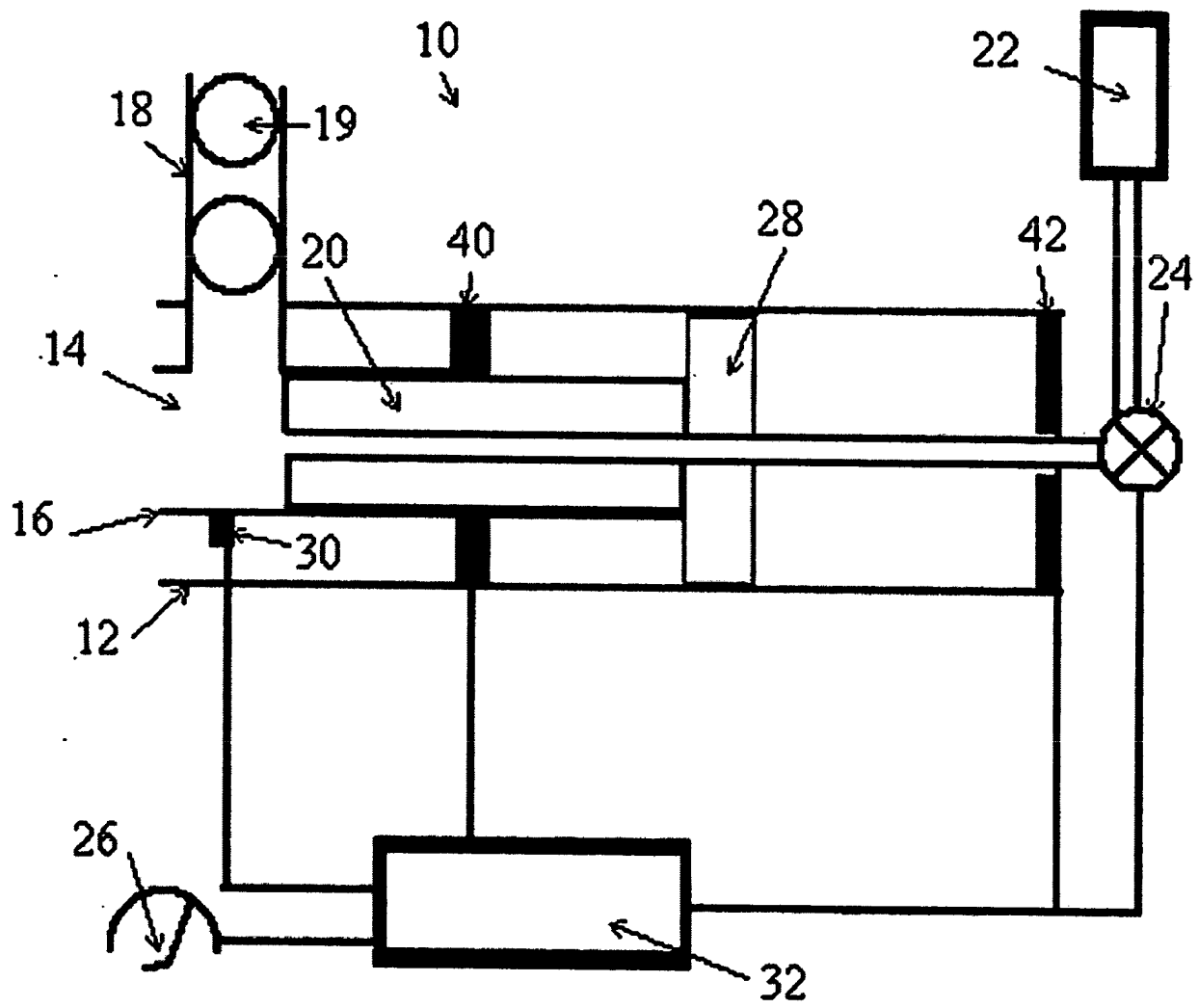


FIG. 1

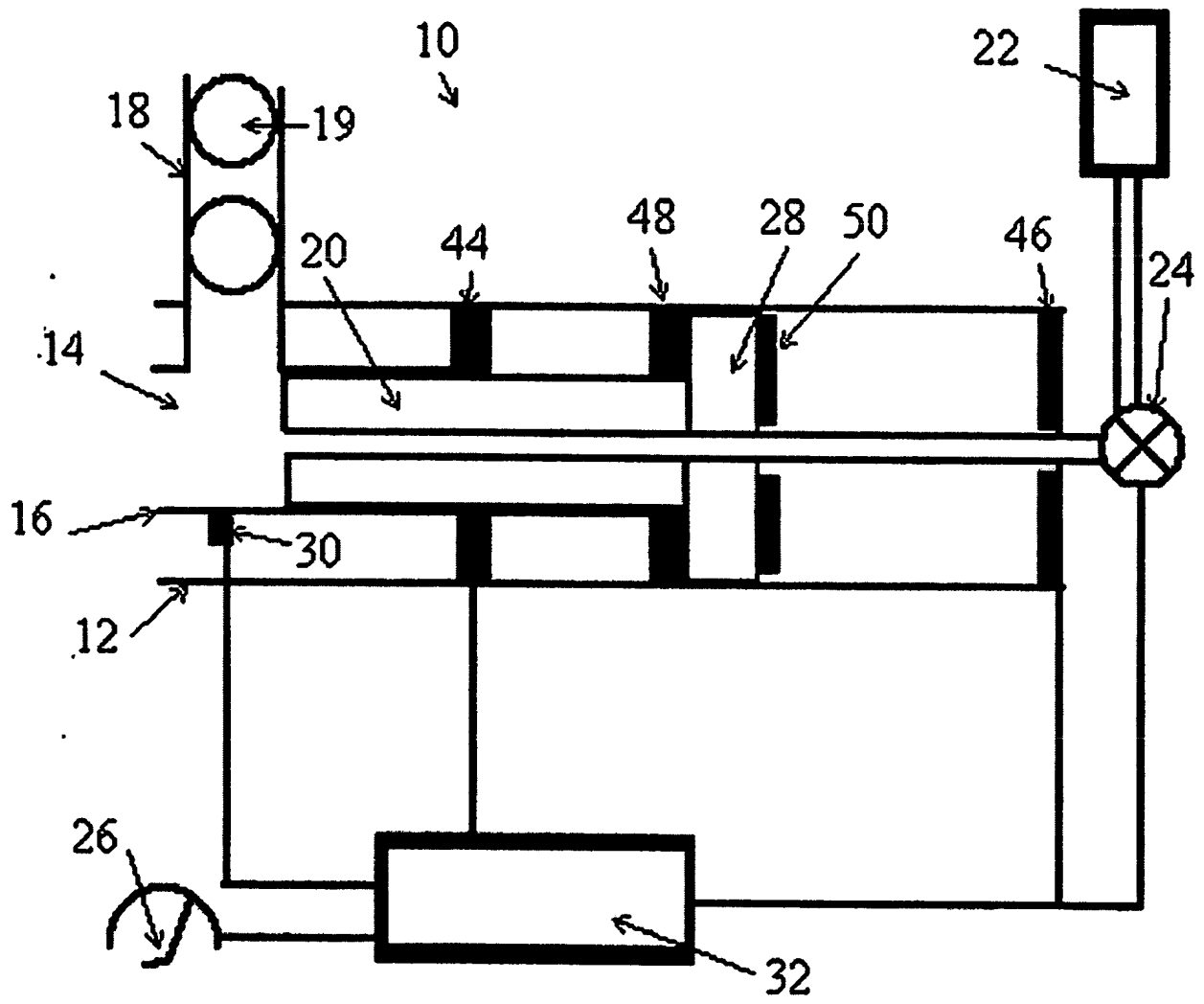


FIG. 2



FIG. 3

Document made available under the Patent Cooperation Treaty (PCT)

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